Programming Instructions

Model 181
Nanovoltmeter

Introduction

The Keithley 181 Nanovoltmeter is easily interfaced to common controllers using the IEEE-488 bus. The following programs select the 2V range and obtain a reading on the following controllers:

APPLE II, DEC LSI-11, HP 85, HP 9825A, HP 9845B, PET/CBM 2001, TEK 4052.

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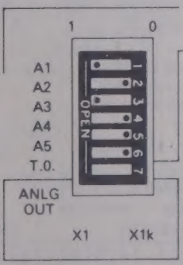

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Program Codes

RANGES:
R1 = 0.002V
R2 = 0.02V
R3 = 0.2V
R4 = 2V
R5 = 20V
R6 = 200V
R7 = 1000V

ZERO:
Z0 = OFF
Z1 = ON

TRIGGER:
T0 = CONT. ON TLK
T1 = ONE SHOT ON TLK
T2 = CONT. ON GET
T3 = ONE SHOT ON GET

RESOLUTION:
B0 = 5½-DIGIT DISPLAY
B1 = 6½-DIGIT DISPLAY

FILTERING:
P0 = FILTER DISABLED
P1 = FILTER 1
P2 = FILTER 2
(Front Panel Filter ON)

DAMPING:
D0 = OFF
D1 = ON

MODE:
M0 = SRQ OFF
M1 = SRQ ON

EOI:
K0 = Send
K1 = Do not send

TERMINATOR:
Y(LF) = CR LF
Y(CR) = LF CR
Y( ) = Any ASCII
Y(DEL) = None

X = Execute
UX = Send status bytes. Sequence is:
R B Z P D M T K Y

DEFAULT: R7B0Z0P1D0M0T0K0Y(LF)

DATA FORMAT: 16 bytes + terminator

FUNCT.				DISPLAY							EXP.			TERMINATOR	
N	D	C	V	+	1	2	3	.	4	5	6	7	E	+	0	CR	LF

N = Normal
Z = Zeroed
O = OFLO

SRQ BYTE:

0			0	X	X	X	X

VALUE:
1 = ERROR
0 = NORMAL
1 = SRQ by 192
0 = SRQ not by 192

ERROR SRQ
0: IddC
1: IddCO
2: CONFLICT
3: NO REMOTE

DATA SRQ
0: Normal
1: Overflow
2: BUFFER FULL

These programs are designed to be a simple aid to the user, and are not intended to suit specific needs. Detailed programming information can be found in the manual.

The programs display one reading at the output of the controller. The program provides an ASCII string variable output (A$), of the form:

NDCV + 0.000000E 0 CR LF

The note at the end of each program indicates modifications to provide a numeric variable (A) in exponential form:

+ 0.00000E + 00

APPLE II (APPLE Interface)

The program below obtains one reading from the Model 181 NVM and displays the reading on the APPLE II screen, using an APPLE IEEE-488 Interface.

DIRECTIONS

1. Set switches on 181 to ADDRESSABLE mode, primary address 5.
2. Connect 181 to APPLE II and APPLE IEEE-488 Interface.
3. Enter the program below using the RETURN key after each line.
4. Type in RUN and depress the RETURN key.
5. The display will read "TEST SETUP".
6. To program the 181 to the 2V range and take a reading, type in R4X and depress the RETURN key.
7. Display will read NDCV + 0.00000E + 00 for "0" volts in.

PROGRAM	COMMENTS
10 DIM A$(20), B$(20)	To dimension data string.
20 Z$ = CHR$(26)	
30 INPUT "TEST SETUP?";B$	Enter programming command. (Example: 2V range = R4X.)
40 PR#3	Send output to IEEE bus.
50 IN#3	Get input from IEEE bus.
60 PRINT "RA"	Turn remote ON.
70 PRINT "WT%";Z$;B$	Output programming command to 181.
80 PRINT "LF1"	Linefeed on.
90 PRINT "RDE";Z$;: INPUT " ";A$	Read data from 181.
100 PRINT "UT"	Untalk.
110 PR#0	Send output to CRT.
120 IN#0	Get input from keyboard.
130 PRINT A$	Display data string.

```
140 GO TO 30                          Repeat.
```

NOTE: If conversion to numeric variable is desired, add the following:

```
134 A=VAL(MID$(A$,5,15))              Convert string to numeric
                                      value.
136 PRINT A
```

APPLE II (CCS Interface)

The program below obtains one reading from the Model 181 NVM and displays the reading on the APPLE II screen, using a California Computer Systems IEEE Interface.

DIRECTIONS

1. Set switches on 181 to the addressable mode, primary address 5.
2. Connect 181 to APPLE II and California Computer Systems IEEE Interface.
3. Enter the program below using the RETURN key after each line.
4. Type in RUN and depress the RETURN key.
5. The display will read "TEST SETUP".
6. To program the 181 to the 2V range and take a reading, type in R4X and depress the RETURN key.
7. Display will read NDCV + 0.000000E 0 for "0" volts in.

```
PROGRAM                               COMMENTS
10   DIM A$(20), B$(20)               To dimension data string.
15   PRINT "TEST SETUP";
20   INPUT B$                         Enter programming command.
                                      (Example: 2V range = R4X.)
30   PR#3                             Set I/O to IEEE Interface.
40   PRINT "@%:"                      Primary address 5.
50   PRINT " ' "; B$; " ' "           Text mode; to output B$.
60   PRINT "@?E:"                     Talk.
70   PR#0                             Set I/O to CRT.
80   INPUT " ";A$                     Input to CRT from IEEE bus.
90   IN#0                             Set I/O to keyboard.
100  GO TO 15                         Repeat.
```

NOTE: If conversion to numeric variable is desired, add the following:

```
82   A=VAL(MID$(A$,5,16))             Convert string to numeric value.
84   PRINT A
```

The program below obtains one reading from the Model 181 NVM and displays the reading on the DEC LSI 11 microcomputer CRT terminal. The LSI 11 must be configured with 16k words of RAM and an IBV 11 IEEE interface. The software must be configured with IB software as well as the FORTRAN and the RT 11 operating system.

DIRECTIONS

1. Set switches on 181 to addressable mode, primary address 5.
2. Connect 181 to the IBV 11 IEEE cable.
3. Enter the program below, using the editor under RT 11 and the name IPHILD.
4. Compile using the FORTRAN compiler as follows: FORTRAN IPHILD
5. Link with the system and IB libraries as follows: LINK IPHILD,IBLIB
6. Type RUN IPHILD and depress the return key.
7. The display will read "ENTER ADDRESS".
8. To program the 181 to the 2V range and take a reading, type in F0R4X and depress the return key.
9. Display will read NDCV + 0.000000E 0 for "0" volts in.

```
PROGRAM IPHILD                          COMMENTS
INTEGER*2 PRIADR
LOGICAL*1 MSG(80), INPUT(80)
    DO 2 I=1, 10
    CALL IBSTER (I,0)                   !Turn off IB errors.
 2  CONTINUE
    CALL IBSTER (15,5)                  !Allow 5 error 15's.
    CALL IBTIMO (120)                   !Allow 1 sec. bus timeout.
    CALL IBTERM ("10)                   !Set LF as terminator.
    CALL IBREN                          !Turn remote on.
 4  TYPE 5
 5  FORMAT (1X, 'ENTER ADDRESS',$)      !Input the address 5.
    ACCEPT 10,PRIADR
10  FORMAT (2I4)
12  TYPE 15
15  FORMAT (1X,'TEST SETUP',$)          !Prompt for test setup.
    CALL GETSTR (5,MSG,72)              !Get the test setup.
    CALL IBSEOI (MSG,-1,PRIADR)         !Program the 181.
18  I=IBRECV (INPUT,80,PRIADR)          !Get data from the 181.
    INPUT (I+1)=0
    CALL PUTSTR (7,INPUT,'0')
    CALL IBUNT                          !Untalk the 181.
    GO TO 12                            !Repeat.
    END
```

HP 85

The program below obtains one reading from the Model 181 NVM and displays the reading on the HP 85 CRT screen, using the 82937A GPIB Interface and an I/O ROM.

DIRECTIONS

1. Set switches on 181 to the addressable mode, primary address 5.
2. Connect 181 to the HP 82937A IEEE Interface.
3. Depress SHIFT SCRATCH and then depress END LINE to erase previous program.
4. Enter the program below using the END LINE key after each line.
5. Depress the RUN key.
6. The display will read "TEST SETUP".
7. To program the 181 to the 2V range and take a reading, type in R4X and depress the END LINE key.
8. Display will read NDCV + 0.000000E 0 for "0" volts in.

PROGRAM	COMMENTS
10 REMOTE 705	Turn remote on.
20 DISP "TEST SETUP"	Prompt for test setup.
30 INPUT A$	
40 OUTPUT 705; A$	Program the 181.
50 ENTER 705; B$	Get data from the 181.
60 DISP B$	
70 GO TO 20	Repeat.
80 END	

NOTE: If conversion to numeric variable is needed, change line 60 as follows:

60 DISP VAL (B$[5])

HP 9825A

The program below obtains one reading from the Model 181 NVM and displays the reading on the HP 9825A using a 98034A HPIB Interface and a 9872A extended I/O ROM.

DIRECTIONS

1. Set switches on 181 to the addressable mode, primary address 5.
2. Connect 181 to HP 9825A and 98034A HPIB Interface.
3. Enter the program below, using the STORE key after each line.
4. Depress the RUN key.
5. The display will read "TEST SETUP".
6. To program the 181 to the 2V range and take a reading, type in R4X and depress the CONT key. (Note: R = range; 4 = 2V range.)
7. Printer will read NDCV + 0.000000E 0 for "0" volts in.

PROGRAM	COMMENTS
0 dim A$[20], B$[20]	To dimension data string.
1 dev "181", 705	Define Model 181 NVM Primary address.
2 rem "181"	Enter programming command. (Example: 2V range = R4X.)
3 ent"TEST SETUP", A$	
4 wrt "181", A$	Output program command to Model 181 via IEEE bus.
5 red "181", B$	Read data from Model 181 via IEEE bus.
6 prt B$	Print data on hard copy printer.
7 gto 3	Repeat.

NOTE: If conversion to numeric variable is desired, omit lines 6 and 7 and substitute:

6 "e"→B$[14, 14]; flt5	Convert to numeric value.
7 prt val(B$[5])	
8 gto 3	Repeat.

HP 9845B

The program below obtains one reading from the Model 181 NVM and displays the reading on the HP 9845B screen using a 98034A HPIB Interface and an I/O PROM.

DIRECTIONS

1. Set switches on 181 to the addressable mode, primary address 5.
2. Connect 181 to HP 9845B and 98034A Interface.
3. Enter the program below using the STORE key after each line.
4. Depress the RUN key.
5. The display will read "TEST SETUP" in the lower left corner.
6. To program the 181 to the 2V range and take a reading, type in R4X and depress the CONT key.
7. Display will read NDCV + 0.000000E 0 for "0" volts in.

PROGRAM	COMMENTS
10 DIM A$(20), B$(20)	To dimension data string.
20 E181 = 705	Define Model 181 NVM Primary address.
30 INPUT "TEST SETUP", B$	Enter programming command (Example: 2V range = R4X).
40 OUTPUT E181; B$	Output program command to Model 181 via IEEE bus.
50 ENTER E181; A$	Read data from Model 181 via IEEE bus.

```
60  PRINT A$                    Print data on 9845B CRT.
70  GO TO 30                    Repeat.
```

NOTE: If conversion to numeric variable is desired, omit line 60 and substitute:

```
60  PRINT VAL (A$ [5;9])        Convert string to numeric value.
70  GO TO 30                    Repeat.
```

PET/CBM 2001

The program below obtains one reading from the Model 181 NVM and displays the reading on the PET/CBM 2001 Series.

DIRECTIONS

1. Set switches on 181 to the addressable mode, primary address 5.
2. Connect 181 to PET/CBM 2001 IEEE Interface.
3. Enter the program below using the RETURN key after each line.
4. Type RUN and depress the RETURN key.
5. The display will read "TEST SETUP".
6. To program the 181 to the 2V range and take a reading, type in R4X and depress the RETURN key.
7. Display will read NDCV + 0.000000E 0 for "0" volts in.

PROGRAM		COMMENTS
10	OPEN 6,5	Open file 6, primary address 5.
20	INPUT "TEST SETUP"; B$	Enter programming command. (Example: 2V range = R4X.)
30	PRINT#6,B$	Output to the IEEE bus.
40	INPUT#6,A$	Read data from Model 181 via IEEE bus.
50	IF ST = 2 THEN 40	If time out, input again.
60	PRINT A$	Print data.
70	GO TO 20	Repeat.

NOTE: If conversion to numeric variable is desired, omit line 60 and type the following:

```
70  A = VAL (MID$(A$,5,16))     Convert string to numeric value.
80  PRINT "A = "; A
90  GO TO 20                    Repeat.
```

The program below obtains one reading from the Model 181 NVM and displays the reading on the TEK 4052 graphics terminal, with a 4051 GPIB Interface.

DIRECTIONS

1. Set switches on 181 to the addressable mode, primary address 5.
2. Connect 181 to TEK 4051 IEEE Interface.
3. Enter the program below using the RETURN key after each line.
4. Type in RUN.
5. The display will read "TEST SETUP".
6. To program the 181 to the 2V range and take a reading, type in R2X and depress the RETURN key.
7. Display will read NDCV + 0.000000E 0 for "0" volts in.

PROGRAM	COMMENTS
5 PRINT @ 37, 0: 10, 255, 13	
0 PRINT "TEST SETUP"	Prompt for the test setup.
0 INPUT A$	
0 PRINT @ 5:A$	Program the 181.
0 INPUT %5:A$	Get the data from the 181.
0 PRINT B$	
0 GO TO 10	Repeat.

NOTE: If conversion to numeric value is needed, change 40 and 50 to:

```
40  INPUT %5:A
50  PRINT A
```

KEITHLEY

Keithley Instruments, Inc.
28775 Aurora Road
Cleveland, Ohio 44139
(216) 248-0400